भारतीय मानक
Indian Standard

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पत्थर-पॉलीमर संमिश्रित फर्श की टाइल और तख्त — विशिष्टि

Stone-Polymer Composite Flooring Tiles and Planks — Specification

ICS 91.060.30

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December 2022 **Price Group 7**

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Flooring, Wall Finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

Stone-polymer composite (SPC) tiles and planks are manufactured from polymeric material (generally PVC) and stone powder blends. These tiles are light in weight and provide dust free construction site, having noise absorbing characteristics, and used to provide decorative surface for buildings of various types. These tiles and planks used as floor coverings are available in different shades and designs.

These tiles are made in different layers, that is, polymeric core, print layer, wearing layer, UV coating, and backing layer, if required.

This standard excludes any requirement about the general appearance of the tile or plank.

In the formulation of this standard, assistance has been taken from ASTM F3261-20 – 'Standard specification for resilient flooring in modular format with rigid polymeric core'.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STONE-POLYMER COMPOSITE FLOORING TILES AND PLANKS — SPECIFICATION

1 SCOPE

This standard specifies requirements of stone-polymer composite (SPC) flooring tiles and planks. It includes tiles and planks with or without a locking system that are printed/surface decorated, protected by a wearing layer, and have a backing layer when required.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
3464 : 1986	Methods of test for plastic flooring and wall tiles (*second revision*)
9766 : 1992	Flexible PVC compounds — Specification (*first revision*)
15061 : 2002	Automotive vehicles — Flammability requirements

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Stone-Polymer Composite (SPC) Tile/Plank – A tile/plank, having a print layer, protected by a wearing layer and UV coating, over a polymeric core as part of the product structure. It may have a locking system. A backing layer may be glued to the tile/plank, if required (*see* Fig. 1). Generally, tiles are shaped as squares, and planks are shaped as rectangles.

3.2 Backing Layer – The layer located below the polymeric core that provides functional properties, such as balance, thickness and noise reduction.

3.3 Gap Difference – The gap between the two tiles/planks after laying (*see* Fig. 3).

3.4 Height Difference – The height difference between the two tiles/ planks after laying (*see* Fig. 3).

3.5 Locking System – Typical example of locking system is shown in Fig. 2.

3.6 Peel Strength – The strength between polymeric core layer and combined print and wear layer.

3.7 Polymeric Core – The polymeric core layer which provides dimensional stability, stiffness, thickness, and other physical properties that the finished resilient flooring requires.

3.8 Print Layer – The layer bonded to the polymeric core of SPC tile/plank for visual aesthetics.

3.9 UV Coating – UV cured protective coating over the wearing layer of SPC tile/plank to increase its scratch resistance.

3.10 Wearing Layer – The layer of that protects the print layer from wearing and is bonded to the print layer.

4 MATERIALS

The polymeric core is made using polymer, stone powder, pigments and compounded with suitable lubricants, processing aids and stabilizers. Materials such as cork, irradiation cross-linked polyethylene (IXPE) foam, ethylene-vinyl acetate (EVA) and the like could be used as backing layers (if required).

5 MANUFACTURE

5.1 Tiles or planks shall be made in different layers, that is polymeric core, print layer, wearing layer and UV coating, and a backing layer, if required. They may be produced by any suitable method of processing and laminating different layers and may further undergo post-lamination processes which may be provided with a locking system.

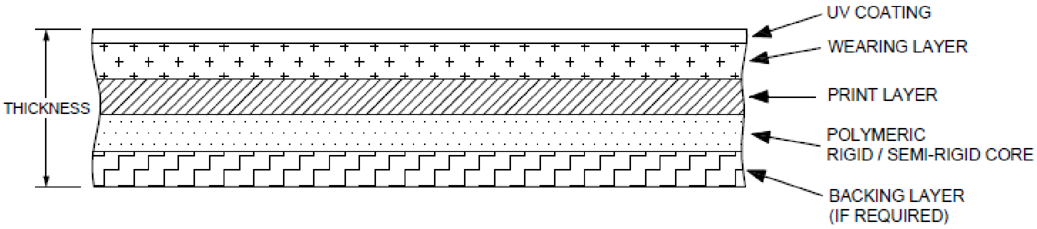

FIG. 1 AN ILLUSTRATIVE OF STONE-POLYMER COMPOSITE (SPC) TILE/PLANK

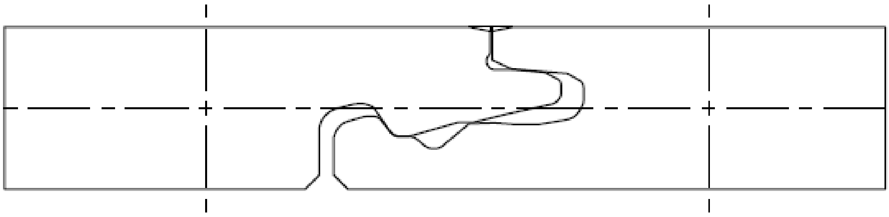

FIG. 2 TYPICAL LOCKING SYSTEM

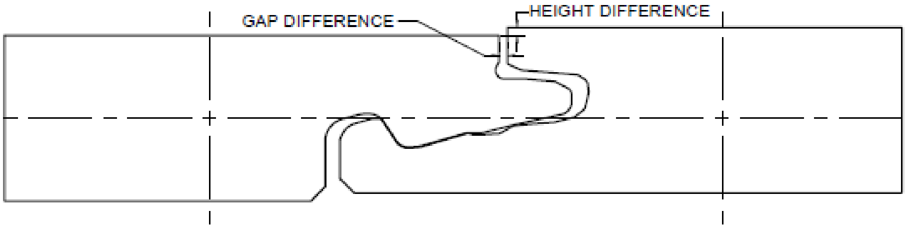

FIG. 3 TYPICAL EXAMPLE OF GAP AND HEIGHT DIFFERENCE

6 REQUIREMENTS

6.1 Workmanship, Finish, Colour and Appearance

The pattern, colour and surface appearance shall be as mutually agreed between the manufacturer and the purchaser. The tiles and planks when visually inspected in natural daylight, after laid out on a level floor in any desired pattern of flooring, approximately covering a square area of 1 m^2 shall not contain any visual defects like blisters, colour spots, air bubbles, holes and the like.

6.2 Dimensions and Tolerances

6.2.1 *Size of SPC Tiles/Planks*

The nominal length and width of the tile/plank shall be as agreed upon between the purchaser and manufacturer or as declared by the manufacturer on the label of the product.

6.2.2 *Thickness*

The nominal thickness of the tile and plank shall be as agreed between the purchaser and manufacturer or as declared by the manufacturer. However, the nominal thickness shall not be less than 2 mm.

6.2.3 *Tolerances*

The tolerance on the nominal dimensions of the finished tiles/planks shall be as given in Table 1.

6.3 Physical and Mechanical Requirements of Stone-Polymer Composite Tile/Plank

The tiles/planks shall comply to physical and mechanical requirements as given in Table 2.

Table 1 Tolerances on Nominal Dimensions of Stone-Polymer Composite Tile/Plank
(*Clauses* 6.2.3 and 8.3)

Sl No.	**Dimension**	**Tolerance**	**Method of Test, Ref to**
(1)	(2)	(3)	(4)
i)	Length	± 0.4 mm	IS 3464
ii)	Width	± 0.4 mm	IS 3464
iii)	Mean thickness	± 0.13 mm; and the variation between any two measurements shall not exceed 0.20 mm	IS 3464

Table 2 Physical and Mechanical Requirements of Stone-Polymer Composite Tile/Plank
(*Clauses* 6.3 and 8.3)

Sl No.	**Characteristic**	**Requirement**	**Method of Test, Ref to**
(1)	(2)	(3)	(4)
i)	Squareness, mm, *Max* (*see* Note 1)	0.25	IS 3464
ii)	Dimensional stability, percent, *Max* (*see* Note 2)	0.25; and the specimen shall show no signs of curling	IS 3464
iii)	Peel strength, kN/m, *Min*	1.05	IS 3464
iv)	Residual indentation, mm, *Max*	0.10	IS 3464
v)	Resistance to staining, cleanability score	< 20	Annex A
vi)	Abrasion resistance, percent by weight, *Max*	0.5	Annex B
vii)	Gap difference		Annex C
	a) Average value, mm, *Max*	0.1	
	b) Maximum value, mm	0.2	
viii)	Height difference		
	a) Average value, mm, *Max*	0.1	
	b) Maximum value, mm	0.15	
ix)	Locking strength of both sides, kN/m, *Min*, (*see* Note 3)	2.5	Annex D
x)	Flammability test (horizontal and vertical rate of burning), mm/min, *Max* (*see* Note 4)	100	IS 15061
xi)	Colour fastness to daylight exposure, standard rating, *Min*	4	IS 9766

NOTES

1 Gap between the sides of the tiles/planks and the arms of the metal jig towards the farther end from the junction of the arms.

2 Change in any linear dimension in percent. In case of small size tiles/planks, specimen size shall be 150 mm x 150 mm. And three sets of equally spaced reference marks shall be marked along each linear dimensions of the surface of the test specimen the marks in each set being 120 mm apart.

3 Applicable for tiles/planks with locking system.

4 In case of vertical rate of burning, for smaller size tiles/planks, the sample dimensions shall be 560 mm x 150 mm. The flame application time may be increased from 15 s to 30 s for vertical rate of burning, as and when desired by the purchaser/user.

7 CONDITIONING

Unless otherwise mentioned, all specimens shall be conditioned for a minimum 24 h at 27 ± 2 °C temperature and 65 ± 5 percent relative humidity before conducting the prescribed tests.

8 LOT, SAMPLING AND CRITERIA FOR CONFORMITY

8.1 All tiles/planks of same size (including thickness) manufactured under same conditions and from same raw materials in one consignment shall constitute a lot.

8.2 All tiles/planks shall be selected at random in accordance with Table 3 and tested for visual tests specified in **6.1**. The selected tiles/planks shall comply with the requirements specified in **6.1**. However, the permissible number of defective tiles shall be as given in Table 3.

8.3 Representative samples shall be further selected at random from the tiles/planks conforming in **8.2** and shall be tested for the requirements specified in Table 1 and Table 2. The samples selected in **8.2** and **8.3** shall meet the prescribed requirements of this standard. The colour fastness to daylight exposure test shall be carried out once in two months.

9 MARKING

9.1 All tiles/planks shall be packed in boxes with specified sizes to avoid damages. Each box of stone-polymer composite tiles/planks shall be indelibly and legibly marked with the following particulars:

a) Manufacturer’s name, brand name or his recognized trade mark, if any;
b) Product identification;
c) Batch/ lot number;
d) Date of manufacture;
e) Nominal size (length x width x thickness); and
f) Number of tiles/planks.

9.1.2 The package of tiles/planks may also be marked with the ISI Certification Mark.

9.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

Table 3 Sample Size and Criteria for Conformity Stone-Polymer Composite Tile/Plank
(*Clause* 8.2)

Sl No. (1)	No. of Tiles/Planks in the Lot (2)	No. of Tiles/Planks to be Selected in Sample (3)	Permissible No. of Defective Tiles/Planks (4)
i)	Up to 90	13	0
ii)	91 to 150	20	1
iii)	151 to 280	32	2
iv)	281 to 500	50	3
v)	501 to 1 200	80	5
vi)	1 201 to 3 200	125	7
vii)	3 201 to 10 000	200	10
viii)	10 001 to 35 000	315	14
ix)	35 001 to 150 000	500	21
x)	150 001 to 500 000	800	21
xi)	500 001 and above	1 250	21

ANNEX A

(*Table* 2)

RESISTANCE TO STAINING

A-1 GENERAL

This test method determines stain resistance of SPC tiles/planks.

A-2 APPRATUS AND CHEMICALS REQUIRED

A-2.1 Liquid Soap, 5.0 percent sodium hypochlorite and baking soda.

A-2.2 Test Reagents, Distilled water, ethanol solution, household ammonia, 10 percent citric acid, vegetable oil, coffee, tea, tomato ketchup, mustard oil, 10 percent povidone-iodine, black permanent marker, pencils, wax crayon and black shoe polish.

A-2.3 Stopwatch

A-3 PROCEDURE

A-3.1 The test specimen (complete tile/plank) to be divide into 15 segments.

A-3.2 Place a spot/drop of each reagent upon the surface of the specimen.

A-3.3 Allow the specimen to stand undisturbed for 24 h at lab conditions as mentioned in **7**.

A-3.4 Follow the cleaning procedure as below. If any stain remains, proceed to the next step.

a) Flush with tap water and wipe gently with a sponge. If this step removes the test reagent, it shall be graded ‘0’.

b) Sponge with liquid soap fixed with a weight having a mass of 1 kg on it. Push the weighted sponge back and forth for 25 cycles. If this step removes the test reagent, it shall be graded ‘1’.

c) Add baking soda using a stiff nylon bristle brush, scrub the remaining areas where staining reagent remains for 25 cycles. If this procedure removes the test reagent, it shall be graded ‘2’.

d) Using a cotton ball saturated with the acetone, rub the stain gently for two minutes. If this procedure removes the test reagent, it shall be graded ‘3’.

e) Place a cotton ball saturated with sodium hypochlorite bleach on the stain for two minutes. If this procedure removes the test reagent, it shall be graded ‘4’.

f) If any test reagent remains visible after the above steps, then the specimen shall receive a grade of ‘5’.

A-4 REPORTS

Add the grades received for each of the stain reagents. The possible range is 0 to 75. Total grade shall be the cleanability score.

ANNEX B

(*Table* 2)

ABRASION RESISTANCE

B-1 GENRAL

This test method measures the abrasion resistance of stone-polymer composite tile/plank using an abrader.

B-2 APPARATUS

Abrasion machine (for reference *see* Fig. 4) can be of single or double abrader, abrader (CS 10 wheel), vacuum unit, analytical balance and brush.

B-3 PROCEDURE

The steps listed in **B-3.1** to **B-3.10** shall be followed.

B-3.1 Three test specimens shall be in the form of discs of nominal diameter 100 mm.

B-3.2 A hole is drilled through the specimen centre to allow fastening to the specimen holder.

B-3.3 Handle specimens with care to eliminate contact with moisture.

B-3.4 Take the initial mass of the specimen, W_1 g.

B-3.5 Place the specimen face up over the rubber mat on the turn-table platform. Secure the specimen using the clamp plate.

B-3.6 Place the vacuum pick-up nozzle in position.

B-3.7 Place the 750 g weight provided with the apparatus on each of the abrader arms.

B-3.8 Also, fix the CS 10 abrader wheel on the machine.

B-3.9 Set the counter to 6 000 cycles and start the machine.

B-3.10 Remove the specimen, clean with a cotton cloth, and note the mass of the specimen, W_2 g.

B-4 REPORTS

Calculate the abrasion resistance (mass loss) as per the following formula:

Abrasion loss = $\frac{W_1-W_2}{W_1} \times 100$, percent.

The average of three specimens shall be reported.

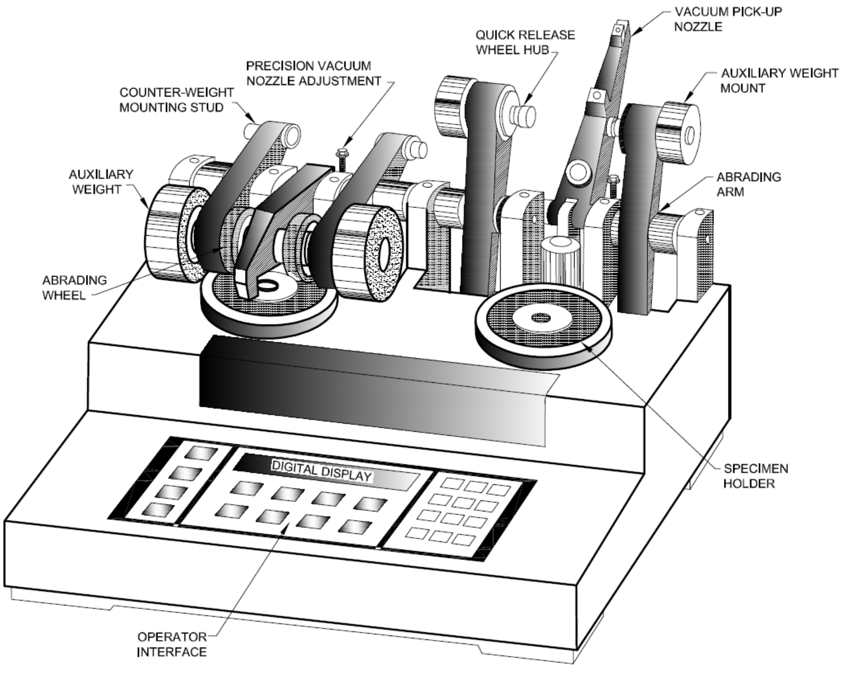

FIG. 4 TYPICAL ABRASION MACHINE

ANNEX C
(*Table* 2)

GAP DIFFERENCE AND HEIGHT DIFFERENCE

C-1 GENERAL

This test method measures the gap difference and height difference between the assembled SPC tiles/planks.

C-2 APPARATUS

Hammer and feeler gauge.

C-3 PROCEDURE

C-3.1 Take 10 finished stone-polymer composite tiles/planks from the lot.

C-3.2 Assemble all tiles/planks on the flat test surface to ensure all joints are properly secured.

C-3.3 Use the feeler gauge to measure the gap difference and height difference at a minimum of five points without applying an external force to the tiles/planks.

C-4 REPORTS

Record the average and maximum value of gap difference and height difference.

ANNEX D

(*Table* 2)

LOCKING STRENGTH

D-1 GENERAL

This test method measures the locking strength of SPC tiles/planks.

D-2 APPARATUS

Universal tensile machine with an accuracy of 0.1 N, feeler gauge and tile/plank cutter, Universal Testing Machine.

D-3 PROCEDURE

D-3.1 Take five sets of the test specimens with locking system.

D-3.2 The length and width of tile/plank specimen shall be 100 mm.

D-3.3 Assemble SPC tiles/planks together.

D-3.4 Fix assembled specimen on the tensile tester. The rate of loading shall be 20 mm/min.

D-3.5 Record the maximum force required to break the joint. And calculate the locking strength by the dividing the recorded force with the specimen width.

D-4 REPORTS

Calculate and report the average locking strength of five specimens.

ANNEX E
(*Foreword*)

COMMITTEE COMPOSITION
Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

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